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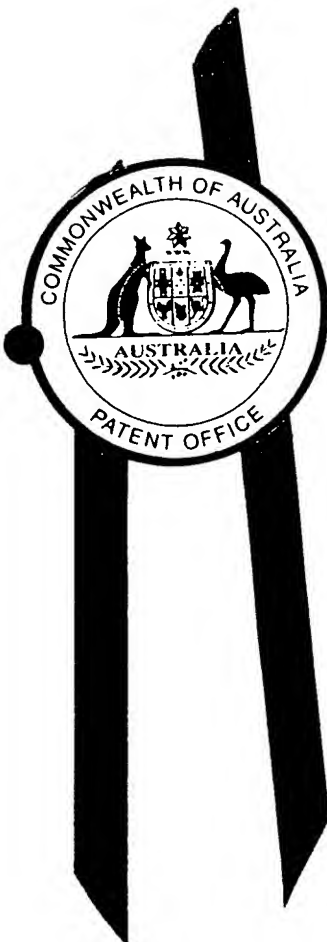
# **PRIORITY DOCUMENT**

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I, CASSANDRA RICHARDS, ACTING TEAM LEADER EXAMINATION  
SUPPORT & SALES hereby certify that annexed is a true copy of the  
Provisional specification in connection with Application No. PQ 3166 for a  
patent by ANDAX PETTS filed on 28 September 1999.



WITNESS my hand this  
Tenth day of January 2001

**CASSANDRA RICHARDS**  
**ACTING TEAM LEADER**  
**EXAMINATION SUPPORT & SALES**

P/00/009  
Regulation 3.2

ANDAX PETTS

AUSTRALIA  
Patents Act 1990

PROVISIONAL SPECIFICATION FOR THE INVENTION ENTITLED:

"WRENCH"

This invention is described in the following statement:

WRENCH

THIS INVENTION relates to a wrench.

The invention has particular application to an adjustable wrench of the type which has internally gripping jaws.

5 Many types of wrench have been used or proposed for gripping a mechanical element requiring application of torque for rotational movement or holding against rotation. Vise grips, for example, use a pair of jaws with multiple pivot points between the jaws together with a lever arm and over-centre locking  
10 arrangement for obtaining a tight grip on an element requiring turning. However, the vise grips are sometimes difficult to remove from the article gripped and are limited in the size range of articles for which they are effective.

Multigrips have a wide range of size adjustments, but, for  
15 gripping an article, are limited to a simple mechanical advantage resulting from the ratio of the jaw length to the handle length, and a tight grip on the handles is required to maintain the grip on the article.

The present invention aims to provide a wrench which  
20 alleviates one or more of the disadvantages of the prior art. Other aims and advantages may hereinafter become apparent.

With the foregoing in view, this invention resides broadly in a wrench including:

first and second jaw members each having first and second  
25 gripping portions for gripping an article to be rotated about a work axis and a leverage portion spaced from said gripping portion;

a handle connected to the leverage portion of the first jaw

member for pivoting movement relative thereto about a leverage axis parallel to said work axis;

engagement means on said handle or operatively connected to said handle for movement therewith for engagement with the  
5 leverage portion of said second jaw member to urge said first and second leverage portions apart, and

connecting means connecting said first and second jaw members and holding them in opposed disposition, the connecting means being operatively interposed between said respective  
10 opposed gripping portions and said opposed leverage portions and being arranged to allow pivoting of one of said jaw members against the other, the connecting means being adjustable in length to vary the distance between the gripping portions to suit different sized articles.

15 The connecting means is preferably in the form of a length adjustable nut and bolt assembly. In a preferred form, the nut is in the form of a cylindrical pin having a diametral bore for receiving a length adjustable bolt comprising a sleeve and a  
20 screw in threaded engagement with a threaded bore extending axially into the sleeve. The nut is in pivotal co-operation with a complementary cylindrical housing provided in the jaw member for pivotal movement about an axis parallel to the work axis. It will be appreciated, however, that other shapes of nut may be provided which still provide pivotal engagement of the  
25 connecting means with the jaw member. Preferably, the nut and bolt assembly is pivotally connected to the first jaw member and the second jaw member includes a tapered bore tapering outwardly from the head of the screw to the opening to accommodate the

length adjustable bolt, and permit relative, but limited, pivoting movement of the length adjustable bolt within the tapered bore. The limiting of the pivoting will limit the amount of rolling of an article held between the respective jaw members.

5 Preferably, the screw has a head held captive in a head retaining cavity provided in the second jaw member, and some of the perimeter of the head is exposed on one or both sides of the second jaw member for turning in a similar fashion to a thumb wheel. It is also preferred that the head retaining cavity is  
10 sized to hold the head captive with a limited degree of free movement axially with respect to the screw and also accommodate the limited degree of pivotal movement determined by the tapering bore in the second jaw member.

Preferably, biasing means is provided operatively  
15 connecting the jaw members for biasing the jaw members towards one another. More preferably, the biasing means comprises a coil spring connected by its respective ends to the respective jaw members intermediate the engagement means and the length adjustable bolt assembly means of each jaw member respectively.

20 The engagement means is preferably a cam in fixed relationship with the handle and co-operable with an abutment surface on the leverage portion of the second jaw member. The cam is preferably located close to the handle's pivotal connection to the first jaw member. The cam is preferably wedge  
25 shaped having a section which expands along a curved axis to provide an inner curved face and an outer curved face. Preferably, the inner curved face follows an arcuate course coaxial with the leverage axis, and the outer curved face follows

a part spiral course from a pointed distal end outward from the inner face until the cam joins the remainder of the handle. Thus, the cam is horn shaped in section when viewed along the leverage axis.

5        In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a preferred embodiment of the invention, and wherein:

10        Fig. 1 is a part sectional and part side view of a wrench in accordance with the invention, the sectional part being taken along lines 1-1 of Figs. 5 and 7;

Fig. 2 is a side view of the wrench apparatus of Fig. 1 shown gripping a circular article;

15        Figs. 3, 4 and 5 are respectively a plan, an elevation and a bottom view of a first jaw member for the wrench of Figs. 1 and 2;

Figs. 6 and 7 are respectively an elevation and a bottom view of a second jaw member for the wrench of Figs. 1 and 2;

20        Fig. 8 is a sectional view of a length adjustable bolt assembly a for the wrench of Figs. 1 and 2;

Figs. 9 and 10 are respectively a plan view and a side elevation of an adjustment collar for the length adjustable bolt assembly of Fig. 8;

25        Figs. 11 and 12 are respectively a plan view and a side elevation of an adjustment screw for the length adjustable bolt assembly of Fig. 8;

Figs. 13 and 14 are respectively a plan view and a side

elevation of a pivot pin for the length adjustable bolt assembly of Fig. 8;

Figs. 15, 16 and 17 are respectively a plan, an elevation and a bottom view of a handle for the wrench of Figs. 1 and 2;

Fig. 18 is a partial side view of the wrench of Figs. 1 and 2 showing the jaws closed against a small article, and Fig. 19 is a partial side view of the wrench of Figs. 1 and 2 showing the jaws closed against a large article.

Referring to Fig. 1, the wrench 10 has first jaw member 11 opposed to a second jaw member 12 and linked thereto by a length adjustable bolt assembly 14. The first jaw member is pivotally connected to a handle 13, and a spring 19 is connected between the first and second jaw members and biased to pull the jaw members towards one another. The first jaw member includes a gripping portion 15 and a first body portion 16, and the second jaw member includes a gripping portion 15 corresponding to the gripping portion on the first jaw member and a second body portion 17. The gripping portions each have a toothed insert 23 in the form of actuate inserts having axially directed teeth disposed across their respective arcuate inner faces. The length adjustable bolt assembly is held in pivotal engagement with the first jaw member by a retaining pin 32 into which a threaded sleeve 26 is inserted. The threaded sleeve receives an adjusting screw 25. The adjusting screw has a shank 27 and a head 28, the head being captive as described hereinafter in the second body portion

The handle 13 is pivotally connected to the first jaw member

at a main pivot 18 which is on the other side of the retaining pin 32 from the gripping portion 15. The handle includes a cam 21 which is curved on an inner side to match the curvature of the main pivot and on an outer side is curved to form a curving wedge or horn shaped section, the outer curve of which may bear against a bearing surface 20 on the second body portion 17 of the second jaw member. The spring 19 is retained in the first and second jaw members inside a spring retaining aperture 22 in the first and second body portions, and is arranged to have a biasing force urging the jaw members towards one another.

Referring to Fig. 3, the wrench maybe used to grasp or grip an article 80 between the first and second jaw members, the tightness of the grip being increased by moving the handle in the direction of arrow 84 which at the same time induces a torque about the axis of the article in direction of arrow 82 and forces the curved surface of the cam harder against the bearing surface. To enhance the tightening of the gripping force, a counter-acting force may be applied to the pivoting end of the handle in the direction of arrow 83. It will be seen that releasing of the grip is achieved by moving the handle in the reverse direction, there being no substantial force to overcome in releasing the jaws from the article.

Referring to Figs. 3, 4 and 5, the first jaw member has a circular retaining pin socket 33 extending laterally therethrough and penetrating each side of the first body portion 16. In the orientation of the jaw member shown, a slotted opening 34 depends downwardly from the retaining pin socket and opens to the underside of the first jaw member, the slotted opening being



arcuate or wedged shaped. A spring retaining aperture 22 also opens to the underside of the first jaw member. On the end of the first jaw member remote from the gripping portion 15, there are two circular pivot lugs 37, each of which are penetrated by a pivot pin aperture 36, the pivot lugs being spaced apart from one another on each side of a slot 38.

Referring to Figs. 6 and 7, the second jaw member 12 has an adjustment sleeve aperture 42 penetrating approximately vertically through the first jaw member, and having a counterbore 43 in the lower end of the adjustment sleeve aperture, the counterbore also having an annular base 47 and a plate retaining slot 44 in its cylindrical wall for retaining a cover plate 46 close to the lower most end of the adjustment sleeve aperture 42. The counterbore and the plate retaining slot are of a diameter which is wider than the thickness of the second body portion and accordingly, the counterbore and plate retaining slot both penetrate each side of the second body portion. The adjustment sleeve aperture is also has tapering sides (seen more clearly in Fig. 1) which permit limited pivoting of the length adjustable bolt assembly therein.

The first jaw member also has a convex mating surface 35 which is an arcuate part of a circle on the lower side of the first jaw member. The convex mating surface matches in radius a concave mating surface 45 on the upper side of the second body portion of the second jaw member 12. A cover plate 46 is inserted into the plate retaining slot 44. The second jaw member 12 also includes the bearing surface 20 which, as can be seen from Fig. 6 is a arcuate portion of a circle in cross section and

shape, the bearing surface being provided on the end of the second body portion remote from the gripping portion 15. The cover plate is preferably an interference fit in the plate retaining slot and formed to be removable therefrom so that, if  
5 required, the wrench may be dismantled.

Referring to Figs. 8 to 14, the length adjustable bolt assembly 14 is shown in Fig. 8 with its three main parts shown in Figs. 9 to 14. In Figs. 9 and 10, the threaded sleeve 26 is shown to include a partly threaded end portion 51 which extends  
10 from a flat sided, but otherwise cylindrical, end portion 52 having two opposed parallel flats 53. The threaded sleeve is generally of a cylindrical shape, the diameter of the threaded end portion being the same as the distance between the flats on the flat sided end portion. A threaded internal bore 54 passes  
15 axially through the threaded sleeve from one end to the other, penetrating both ends of the threaded sleeve. The threaded bore receives the shank 27 of the adjusting bolt 25, but the head 28 of the adjusting bolt fits inside the counterbore 43 of the second jaw member 12, the diameter of the head being larger than  
20 the width of the second jaw member so that part of the head protrudes from the counterbore in the nature of a thumb wheel, engagement of which permits the adjusting bolt to be turned about its axis within the threaded bore of the threaded sleeve to move the adjusting bolt axially to adjust the length of the  
25 combination of the threaded sleeve and adjusting bolt, the head being captured in the counterbore by the base 47 of the counterbore and the cover plate 46, constraining the second jaw member to move towards or away from the first jaw member with the

axial movement of the adjusting bolt in the threaded sleeve. The retaining pin 32 is retained in the retaining pin socket 33 in the first jaw member, the threaded sleeve 26 being retained by threaded engagement in a diametral opening 56 penetrating the retaining pin diametrically, but stopping just short of penetrating the opposite side. The flats on the flat sided end portion 52 permit the treaded sleeve to be tightened with a tool, such as spanner or adjustable wrench, into the diametral opening on the retaining pin.

Referring to Figs. 15 to 17, the handle 13 has a handle shank 61 and a handle grip 62 together making up the bulk of the length of the handle. On the end of the handle shank remote from the handle grip, there is provided an annular handle pivot lug 64 having a handle pivot aperture 63 penetrating sideways therethrough and an annular section matching the pivot lugs 37 on the first jaw member 11. The width of the handle pivot lug is such as to give a clearance fit between the two pivot lugs 37 in the slot 38 so that a pivot pin 31 (shown in Fig. 1) can be inserted through the two pivot pin apertures and the handle pin aperture for pivotal connection of the handle to the first jaw member. The cam 21 is provided on the lower side of the handle protruding from the handle shank and having an inner face 65 and an outer face 66, both of which are curved, the inner face of the cam being duplicated on each side of the handle pivot lug, but the outer face being continued on the underside of the handle pivot lug. The curvature of the inner face substantially matches the circumferential curvature of the handle pivot lug and the two pivot lugs on the first jaw member and the outer face has a

curvature of larger diameter than the inner face.

Referring to Figs. 18 and 19, it can be seen that by screwing the adjusting bolt 25 into the threaded sleeve 26, the first and second jaw members can be drawn together, with action  
5 of the handle tightening the grip on a small diameter article 26 having a diameter represented by dimension arrows 87.

As shown in Fig. 18, whereas by screwing the adjusting bolt outward from the threaded sleeve, the first and second jaw members can be widened to grip a large diameter article 88 having  
10 a large diameter represented by dimension arrows 89. Moving the handle in the direction of the arrow 84 not only causes a tightening of the grip of the jaws on the articles, but also imparts a torque in the direction of the arrow 82 in a similar fashion to that described with respect to Fig. 2 above.

15 In each instance, the cam 21 may be inserted between the body portions of each jaw members by rotation of the handle with respect to the first jaw member, the separating force caused by the outer face of the cam bearing on the bearing surface being accommodated by the head of the adjusting bolt bearing down upon  
20 the base of the counterbore, placing the adjusting bolt in tension with respect to the threaded sleeve, the tension in the threaded sleeve being taken up by the retaining pin 32. It will be seen that the wrench of the present invention uses a double lever principle, one lever being the jaw members acting in  
25 concert with the connecting means, the load for the lever being the gripping force applied to the article being gripped by the jaw members, the fulcrum being the connecting means restraining the jaw members from moving further apart than the adjusted

length of the setting of the adjusting bolt, and the activation of the lever being performed by the action of the cam on the bearing surface. The second lever is the handle in its pivoting relationship with the first jaw member and the wedging action of the cam on the second jaw member, the load being the separating action of the cam on the bearing surface, the fulcrum being the pivoting connection between the handle and the first jaw member, and the activation of the lever being performed by the rotation of the handle as hereinbefore described.

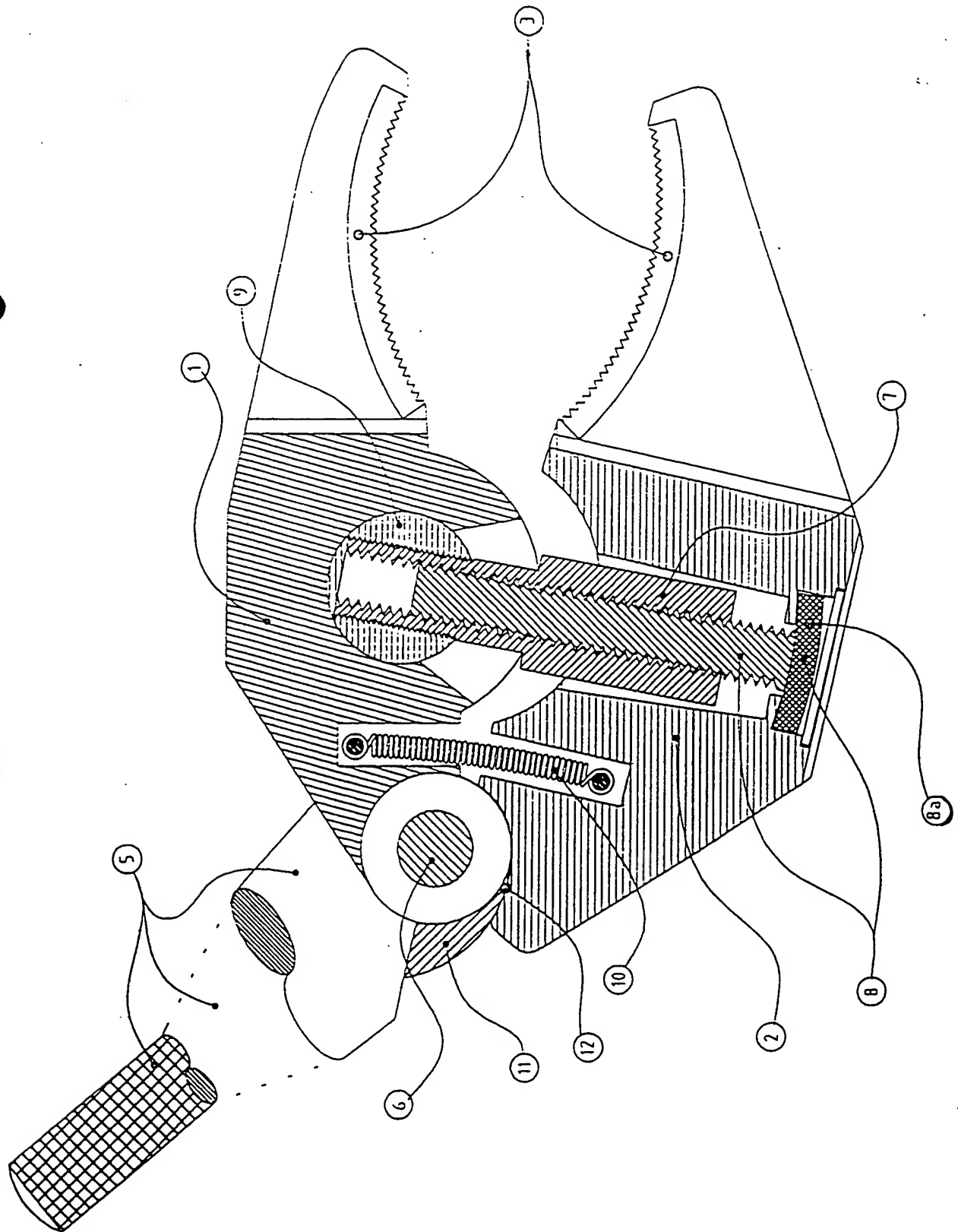
10        It will be appreciated that while the above has been given by way of illustrative example of the invention, all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as herein set forth.

15                    Dated this 28<sup>th</sup> day of September 1999

Andax Petts

By his Patent Attorneys

AHEARNES



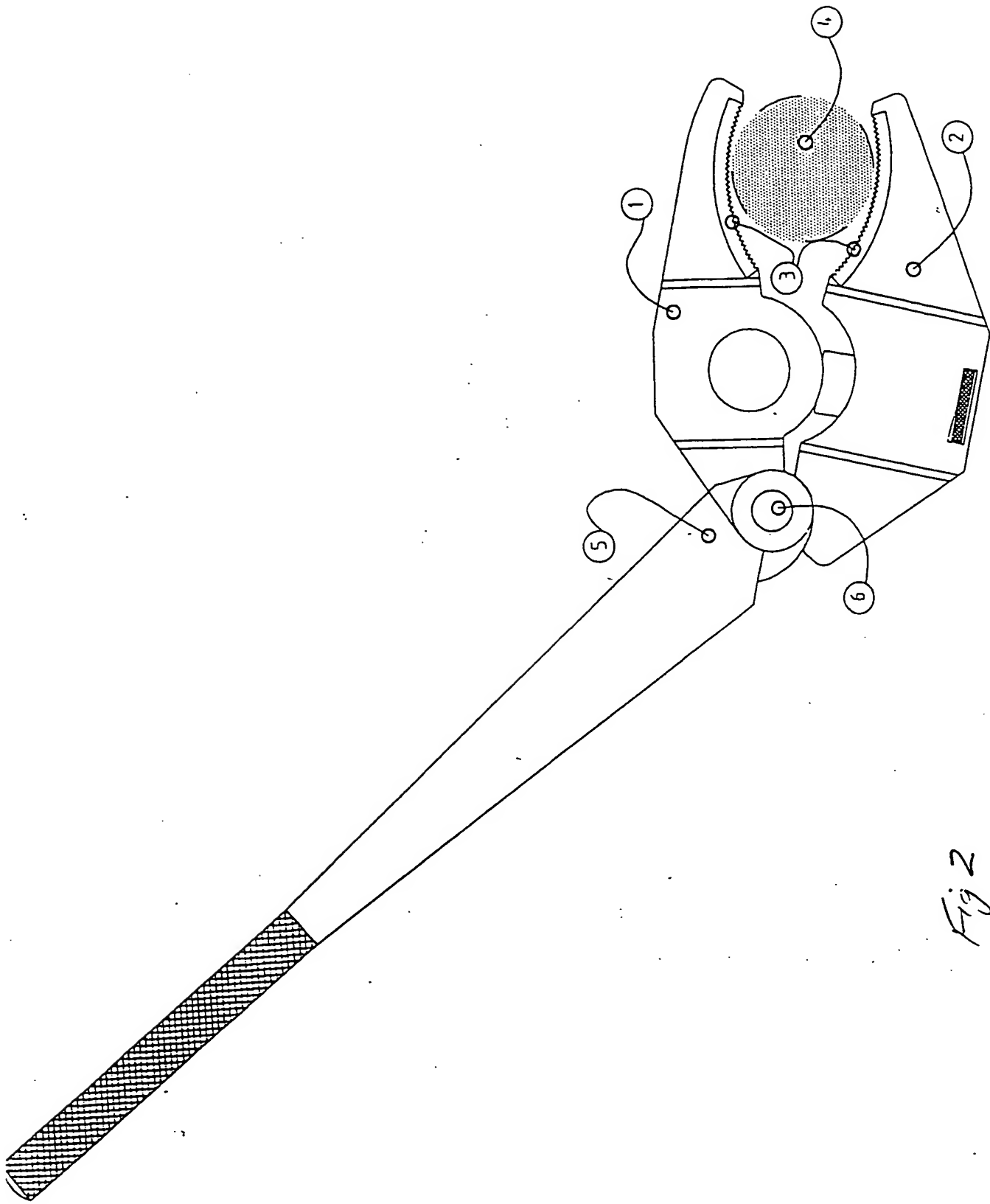


Fig 2

Fig 3

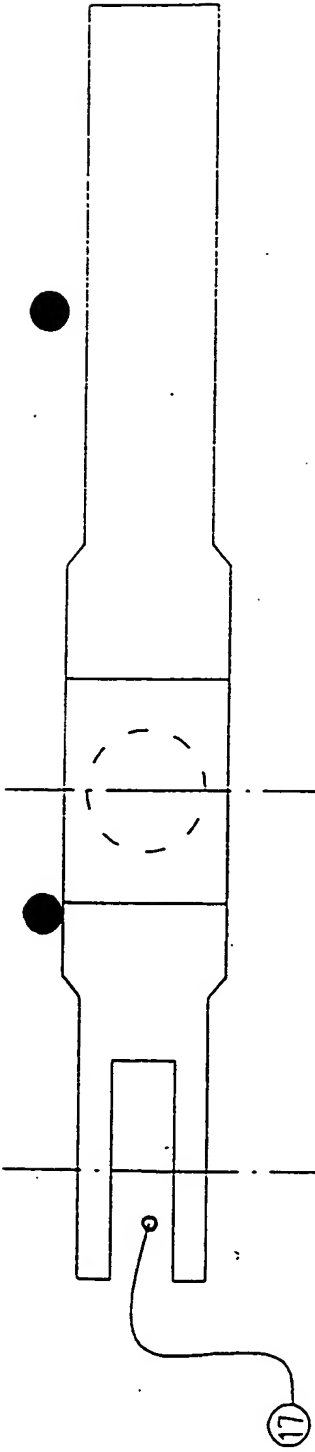


Fig 4

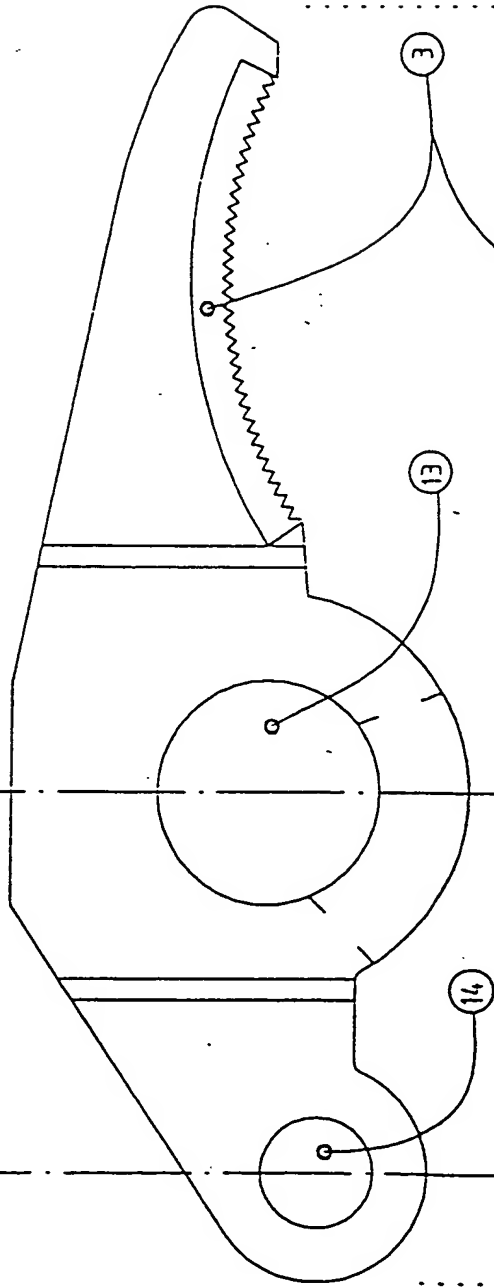
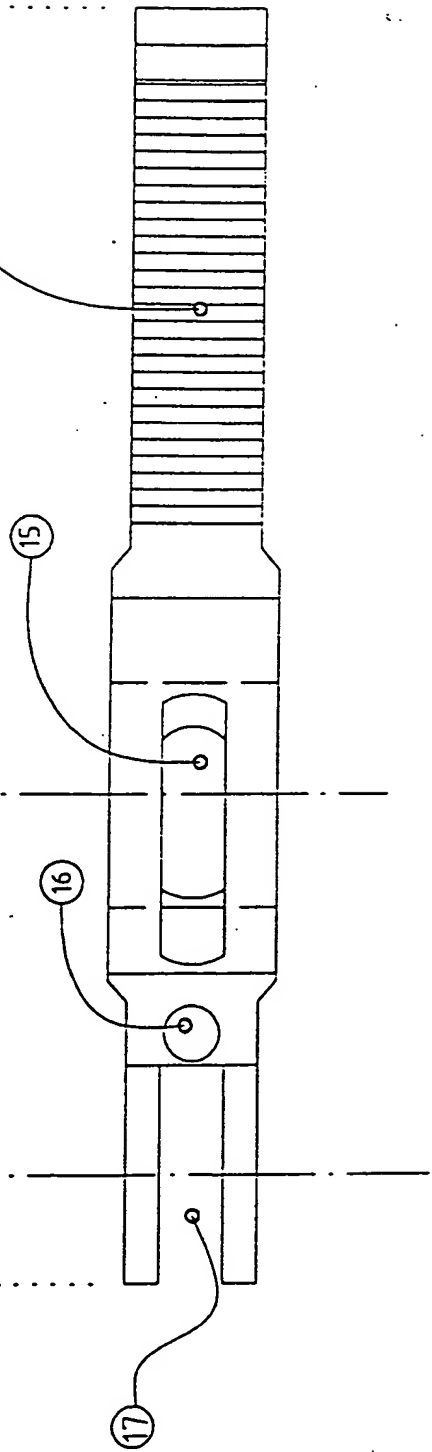
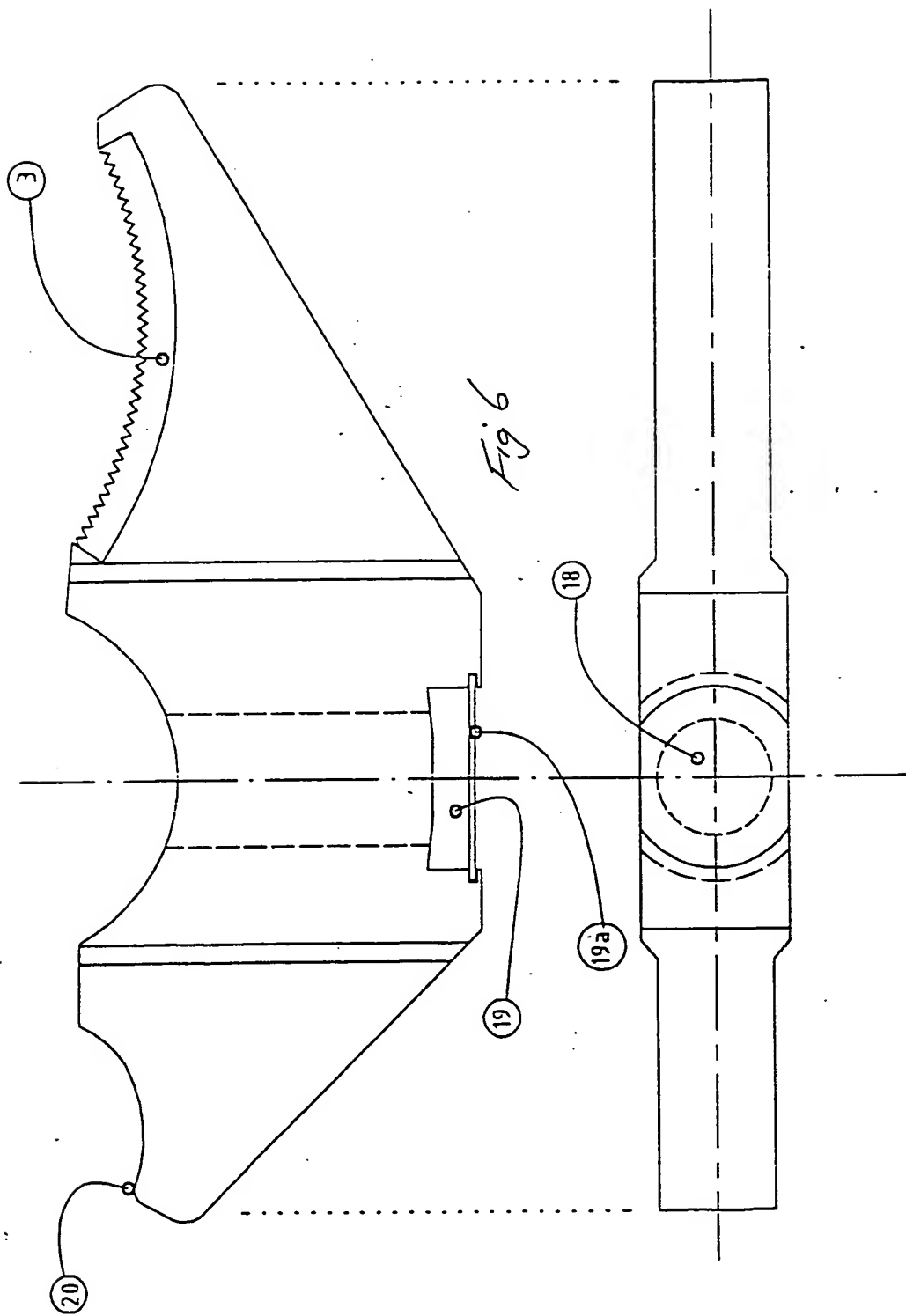


Fig 5







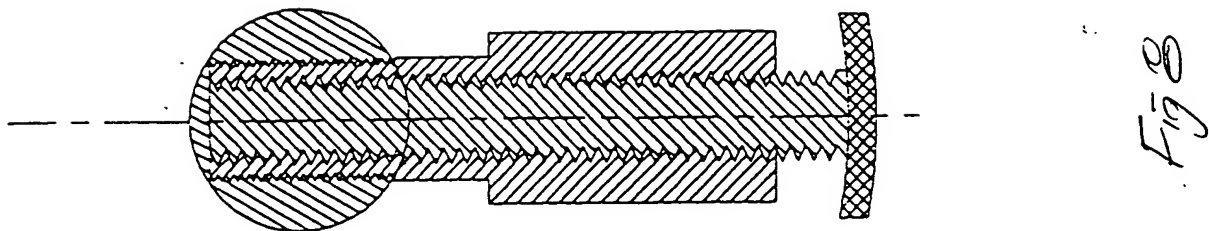
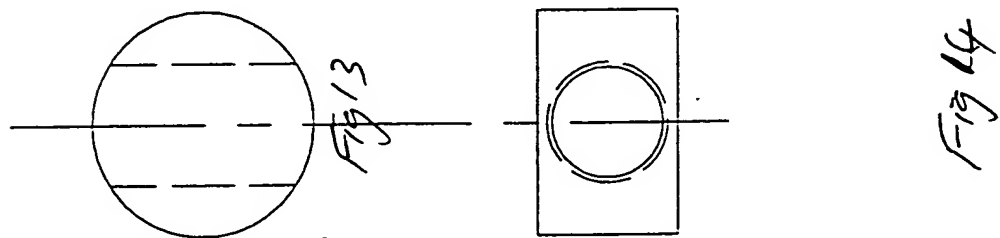
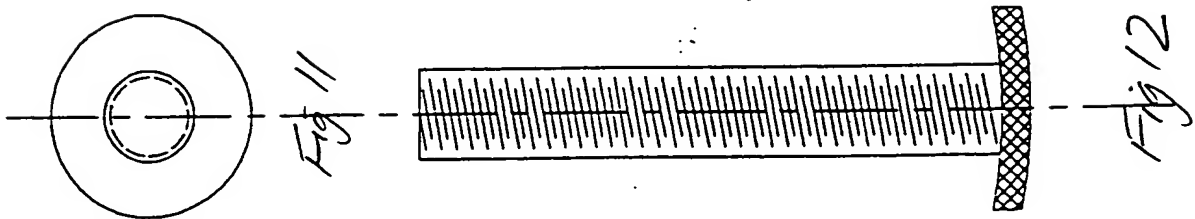
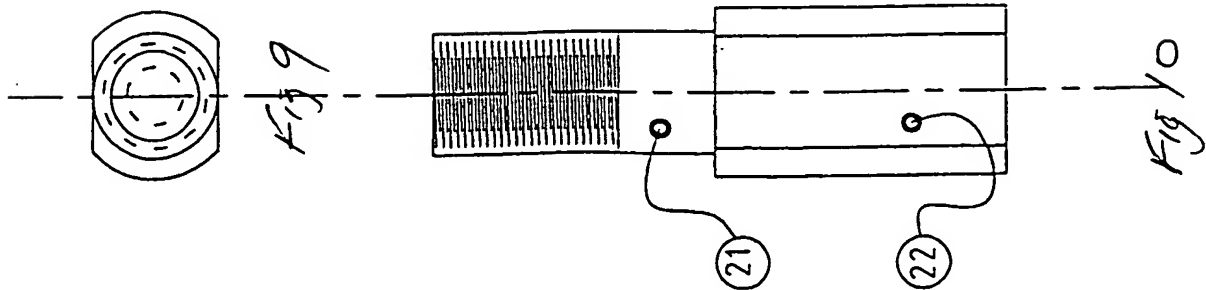




Fig 15

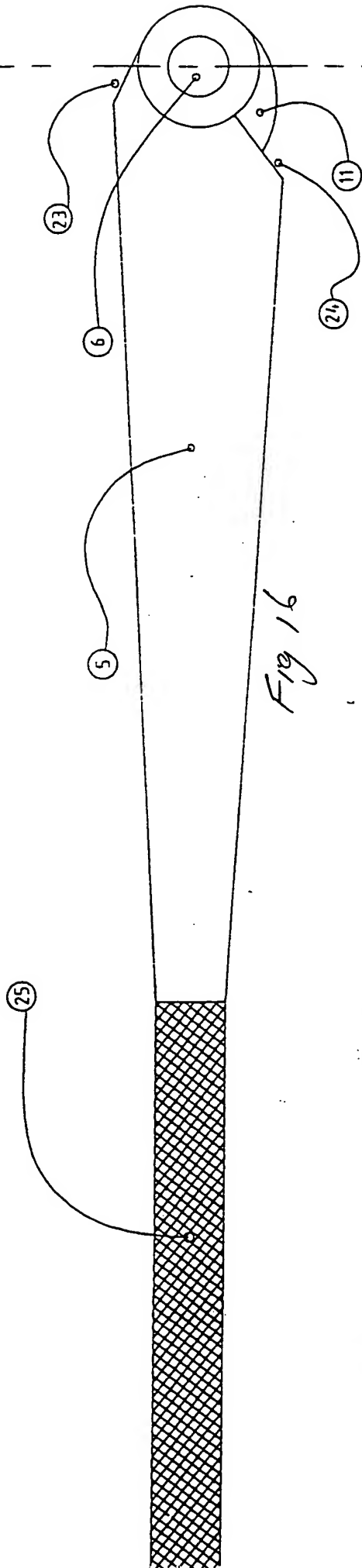


Fig 16

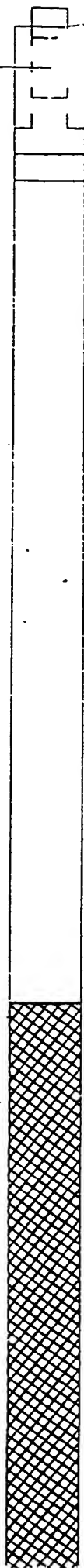


Fig 17

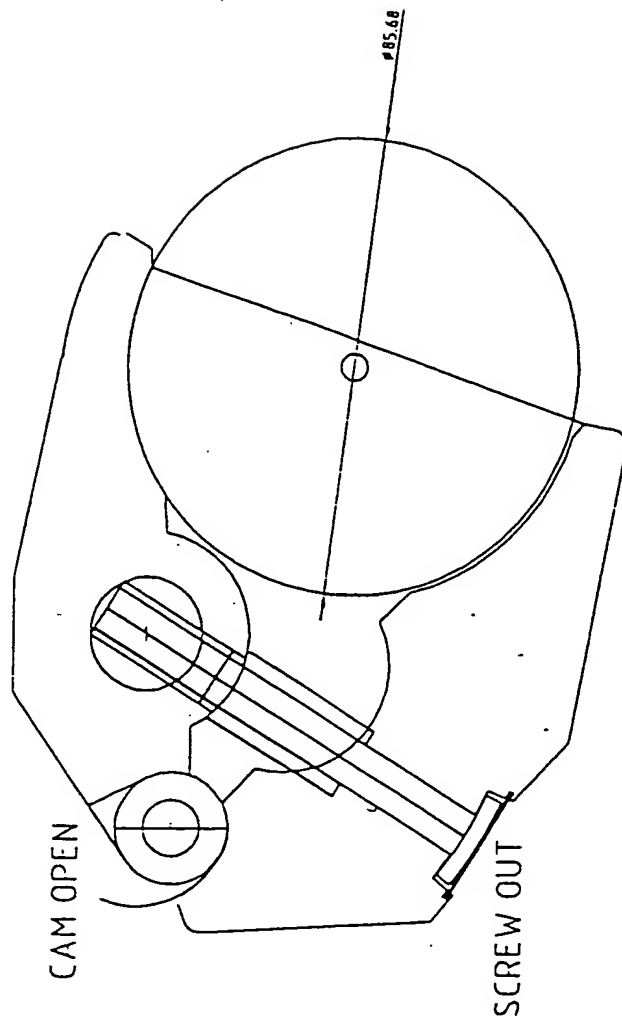


Fig 19

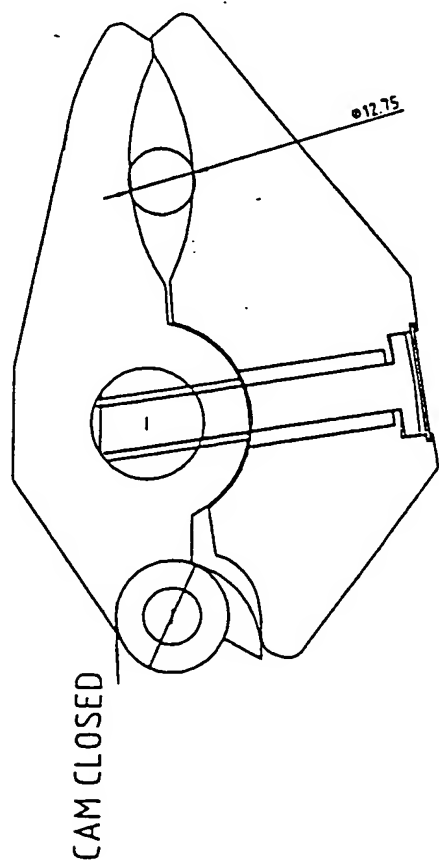


Fig 18